

Identification of the dung beetles *Onitis crenatus* Reiche (Coleoptera: Scarabaeidae) from Ethiopia and *O. crenatus* sensu Boheman from southern Africa

by

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Onitis crenatus Reiche, a scarabaeine dung beetle from Ethiopia, is redescribed and a lectotype is designated. A species from southern Africa, identified by Boheman and later authors as *O. crenatus* Reiche, is described as *O. tortuosus* spec. nov.. Characters to separate *O. vanderkelleni* Lansberge from *O. crenatus* and to separate *O. pecuarius* Lansberge, *O. reichei* Lansberge, *O. vanderkelleni* and *O. viridulus* Boheman from *O. tortuosus* are listed. Geographic distributions are given.

A species of dung beetle, common in southern Africa and identified by Boheman (1857) and later authors as *O. crenatus* Reiche, was introduced into Australia as part of the program for the biological control of cattle dung (Waterhouse 1974). Studies on its biology and geographic distribution indicated that it was unlikely to be the same species as that described by Reiche (1850) from Ethiopia. One male syntype of *O. crenatus* and two females, also from Ethiopia, in the British Museum (Natural History), matched the original description by Reiche but not the species from southern Africa.

Boheman (1857) first described the southern African species but misidentified it as *O. crenatus*. It appears that later authors, for example Lansberge (1875), Péringuey (1902), Janssens (1937) and Ferreira (1967, 1978), did not see the *O. crenatus* type material and repeated the error. This could explain why the geographic distribution of *O. crenatus* has been recorded as the east coast of Africa between Ethiopia and the Cape of Good Hope.

In this paper the true *O. crenatus* of Reiche is redescribed and a male lectotype is designated. Some of the contrasting features of the closely related *O. vanderkelleni* Lansberge are listed. The species from southern Africa is described as *O. tortuosus* spec. nov.. Females of *O. pecuarius* Lansberge, *O. reichei* Lansberge, *O. vanderkelleni* and *O. viridulus* Boheman are sometimes confused with those of *O. tortuosus*. Characters are given to separate both males and females of these species from those of *O. tortuosus*.

The following abbreviations are used for the collections to which the specimens studied belong: ANIC—Australian National Insect Collection, Division of Entomology, Commonwealth Scientific and Industrial Research Organization (CSIRO), Canberra, Australia; DBRU—Dung Beetle Research Unit, CSIRO Division of Entomology, S. African Station, Pretoria; BMNH—British Museum (Natural History), London; NCI—National Collection of Insects, Plant Protection Research Institute, Pretoria; ZSM—Zoologische Staatssammlung, Munich.

Onitis crenatus Reiche, Figs 1–6, 16.

Onitis crenatus Reiche, L. (1850: 328–330, pl. 20 figs 1–1a; type locality: Ethiopia; type: British Museum (Natural History), London).

Onitis herbstii Roth, (1851: 129; type locality: Tigré, Ethiopia; type: Zoologische Staatssammlung, Munich, reported possibly lost (Scherer, *pers. comm.*) Lansberge, 1875: 96–98).

MALE (Lectotype). Overall length 21 mm, width 11 mm.

Colour. Bronze-black, shiny.

Head (Fig. 1). Clypeus with lateral margin rounded, apex emarginate, slightly incurved. Clypeal carina short, situated behind the level of clypeogenal cusps and closer to tubercle of vertex than to clypeal margin. Clypeus weakly rugosely punctate, stronger towards clypeal margin. Frontal carina interrupted medially, equidistant between clypeal carina and tubercle. Gena not prominent. Vertex almost smooth, not bordered at base, with small, longitudinally carinate tubercle.

Pronotum. Bordered only anteriorly and laterally, lateral borders rounded, obliquely truncate and weakly sinuate in front of posterior angles. Punctures on disc sparse and small but rather deep, becoming faint towards the lateral borders. Basal foveae each with rather deep, smooth and slightly elongate impression.

Metasternum. Longitudinally impressed medially, punctate and pubescent laterally and anteriorly between coxae.

Elytra. Striae shallow, stronger at base, fading towards apex, very finely punctate. Lateral borders of striae weakly and irregularly crenulate near base, becoming almost smooth and straight at apex. Elytral lateral carina strongly and regularly crenate. Interstriae almost flat, very finely coriaceous, very finely punctate.

Pygidium. Bordered, basal carina weak, absent medially.

Fore femur (Fig. 2). Anterosuperior edge with obliquely transverse, truncate tooth about two-thirds from base of femur, basal half of anterosuperior edge strongly dilated and carinate. Fore tibia (Fig. 2). Ventral carina with two teeth, apical tooth large, basal tooth small. Middle femur (Fig. 3). Ventrally with short oblique setiferous carina distally. Hind femur (Fig. 4). Posterior edge with stout, acute, slightly incurved tooth. Hind tibia (Fig. 4). Constricted at base, dilating to apex, externosuperior edge with seven single or groups of spinose setae.

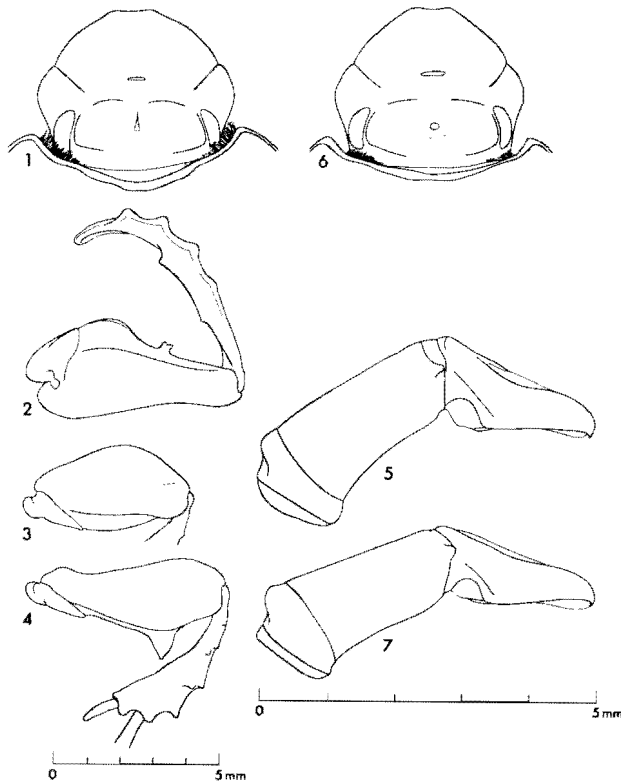
Aedeagus as in Fig. 5.

FEMALE. Sexual dimorphism as usual in this genus. Some features of the two females are: Overall length 17–20 mm, width 9–10 mm. Head (Fig. 6). Clypeus with lateral margins almost straight, apex emarginate and slightly incurved, transversely rugose. Tubercle of vertex stout. Pronotum. Basal foveae rather deep, scarcely elongate.

LECTOTYPE, ♂ (here designated) with labels: '*crenatus* Reiche/Voy. en Abyssinia/Abyssinia; *crenatus*/Reiche/Abyssinia; 705; 67.45; type; syntype' (BMNH). This is the only specimen of Reiche's *O. crenatus* material located.

MATERIAL EXAMINED. ABYSSINIA: 1 ♀ '*crenatus*/♀ Reiche/Abyssinia; *Herbstii*/Roth; 706; 67.45;' and 1 ♀ 'Abyss; Bowring/63–47' (BMNH).

Geographic distribution: Ethiopia (Fig. 16).



Figs 1-7. *Onitis crenatus* Reiche (δ -lectotype). 1. Head, dorsal view. 2. Fore leg, ventral view. 3. Middle femur, ventral view. 4. Hind leg, ventral view. 5. Aedeagus, lateral view. Fig. 6. *O. crenatus* (δ -Ethiopia). Head, dorsal view. Fig. 7. *Onitis vanderkelleni* Lansberge (δ -Kikuyu, Kenya). Aedeagus, lateral view. Figs 1-4 & 6 left scale and 5 & 7 right scale.

NOTES. The name *crenatus* well describes the strong and regular crenations at the sides of the male elytra but these crenations are not unique to this species. The head and the fore tibia of the male and of one of the females are fairly worn; the clypeus and the teeth on the fore tibia are evidently not the original shapes.

O. crenatus belongs to the group III of Janssens (1937), where it keys out as *O. spinicrus* Fairmaire. Janssens (1951) synonymized *O. spinicrus* with *O. vanderkelleni* and specimens of *O. crenatus* may be held in collections under either of these names also.

O. vanderkelleni (= *O. spinicrus*) occurs from Angola through to Kenya (Fig. 16) and displays considerable geographic variation. Specimens from Kenya differ from *O. crenatus* in having: lateral border of gena more prominent; margin between basal foveae distinctly bordered, basal foveae forming long deep groove, foveal groove almost half as long as distance between foveae; pronotal punctures strong on disc; crenation of male elytral lateral carina not so regular; longitudinal medial impression on metasternum weak in both sexes; underside of aedeagus more rounded (Fig. 7); male fore femo-

ral submedian tooth transverse; ventral carina of male fore tibia with 3–4 teeth (occasionally two on only one tibia), apical tooth on ventral carina of fore tibia not so prominent.

Onitis tortuosus spec. nov., Figs 8–13, 17.

Onitis crenatus: Boheman (1857: 252–253); Lansberge (1875: 96–98); Péringuey (1902: 120); Janssens (1937: 22, 55, Figs. 8); Ferreira (1967: 331, 344); Ferreira (1978: 41–45); *nec.* Reiche.

Male (holotype). Overall length 21 mm, width 12 mm.

Colour. Bronze-black, obscurely metallic green.

Head (Fig. 8). Clypeus rugosely punctate, becoming stronger towards the apex, lateral margin rounded, apex recurved and weakly emarginate. Clypeal carina short, situated behind level of clypeogenal cusps and closer to tubercle of vertex than to clypeal margin. Frontal carina broadly interrupted medially, closer to tubercle of vertex than to clypeal carina. Gena not prominent. Vertex not bordered at base, with small, longitudinally carinate tubercle.

Pronotum. Bordered anteriorly and laterally, basal margin bordered only behind and between basal foveae. Punctures strong and sparse on disc, becoming faint laterally. Basal foveae rather deep and slightly elongate.

Elytra. Striae shallow, stronger at base, weakly punctate, sides of striae weakly and rather irregularly crenulate at base to almost straight at apex. Elytral lateral carina crenate. Interstriae almost flat, surface slightly uneven, very finely punctate, finely coriaceous.

Pygidium (Fig. 9). Bordered, basal carina entire, very finely punctate.

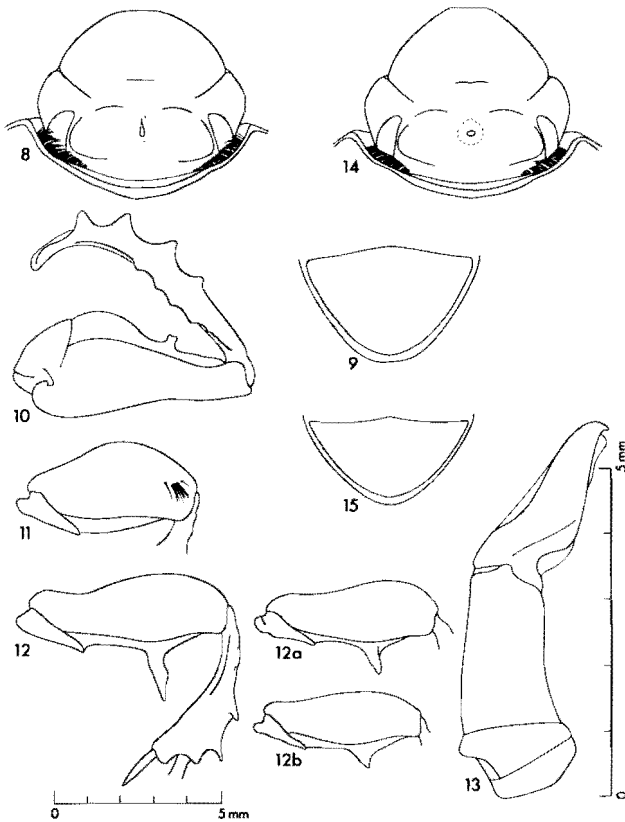
Fore femur (Fig. 10). Anterosuperior edge with slightly oblique, truncate tooth about two-thirds from base of femur. Fore tibia (Fig. 10). Ventral carina with four to six teeth. Middle femur (Fig. 11). Ventrally with short oblique setiferous carina distally. Middle (Fig. 11) and hind trochanters (Fig. 12). Apex slightly spinose. Hind femur (Fig. 12). Posterior edge with long, upright, somewhat tortuous spine. Hind tibia (Fig. 12). Constricted at base, dilating to apex, externosuperior edge with 9–11 single or groups of spinose setae.

Aedeagus as in Fig. 13.

FEMALE. Sexual dimorphism as usual in this genus. Some features of the female are: Head (Fig. 14). Clypeus with apex truncate to slightly emarginate (may be rounded if worn), transversely rugose. Tubercle of vertex stout. Pronotum. Punctures generally stronger and more dense than male. Elytra. Lateral carina generally not crenate but some large females weakly and irregularly crenate. Pygidium (Fig. 15). Broad but pygidium of specimens from Zimbabwe often narrower. Fore and hind femora. Unarmed. Middle and hind trochanters. Not or weakly spinose.

Variation. Length: Male 16–23 mm, female 16–22 mm. Colour of individuals varies from almost black at high altitudes to distinctly metallic green on the hot coastal plains. Surface of interstriae often uneven, often irregularly and transversely wrinkled, especially near base. Elytral lateral carina of small males often irregularly and partly crenate. Number of teeth on ventral carina of male fore tibia varies from four to six in large males to three to four in small males.

TYPES (here designated): Holotype ♂, SOUTH AFRICA: 'ERMELO, T[rans]v[aa]l/ (16 km S) 21.xi.71/ Bornemissza/ Olsen & Davis; 469; Ex Coll. CSIRO/ Div[ision of] Entomology/ S[OUTH] AFRICAN STATION' (NCI).



Figs 8-13. *Onitis tortuosus* spec. nov. (♂-holotype). 8. Head, dorsal view. 9. Pygidium, full view. 10. Fore leg, ventral view. 11. Middle femur, ventral view. 12. Hind leg, ventral view. (12a & b. *O. tortuosus* small ♂-laboratory bred. Hind femurs, ventral view.) 13. Aedeagus, lateral view. Figs 14-15. *O. tortuosus* (♀-laboratory bred). 14. Head, dorsal view. 15. Pygidium, full view. Figs 8-12 & 14-15 left scale, Fig. 13 right scale.

PARATYPES: SOUTH AFRICA. Cape Province: 1 ♂ Kuruman (24 km NE) 10.i.73, A. L. V. Davis (ANIC. Ex DBRU 905); 1 ♂ Franklin (6 km NW) 8.xii.74, Aschenborn, Cat. No. 159 (ANIC); 1 ♂ Cala (20 km SW) 8.xii.74, Aschenborn, Cat. No. 162 (ANIC); 1 ♂ Elliot (11 km SW) 20.i.76, 1 500 m, C. F. Dewhurst (DBRU, 2228); 1 ♀ Ida (10 km S) 20.i.76, 1 550 m, C. F. Dewhurst (ANIC. Ex DBRU, 2229); Transvaal: 1 ♂ Bosbokrand (10 km SW) 10.x.72 Bornemissza & Insley (ANIC. Ex DBRU 682); 1 ♂ Piet Retief (37 km E) 18.x.72, K. M. Olsen (DBRU, 696); 1 ♂ Nelspruit (12 km NE) 10.x.72, Bornemissza & Insley (DBRU, 684); 1 ♂ Carolina (12 km N) 21.i.73, Bornemissza & Insley, (DBRU, 938); 1 ♀ Middelburg 31.xii.73, Cow, A. L. V. Davis (ANIC); 1 ♀ Sabie 11.xi.71, D. F. Waterhouse (ANIC. Ex DBRU, 436); Orange Free State: 1 ♂ Bloemfontein (22 km SE) 30.i.73, A. L. V. Davis (DBRU, 952); 1 ♂ Harri-smith (28 km SW) 11.i.73, H. H. Aschenborn (DBRU, 875); Natal: 1 ♂ Vryheid (20

km N) 27.i.73, Bornemissza & Insley (DBRU, 946); Transkei: 1 ♂ Umtata (18 km SW) 5.ii.73, A. L. V. Davis (DBRU, 981); 1 ♀ Mt. Ayliff 9.xi.74, I. D. Temby (ANIC. Ex DBRU, 1558); 1 ♀ Mt. Frere (16 km E) 9.xi.74, I. D. Temby (ANIC. Ex DBRU, 1560); 7 ♂♂ 10 ♀♀ CSIRO Introduction, Laboratory bred, Canberra 1979-82, (Stocks ex South Africa) (ANIC).

OTHER MATERIAL EXAMINED: 102 ♂♂ and 91 ♀♀ from collections in ANIC, DBRU, BMNH and ZSM. Their localities and those of the type material are plotted in Fig. 17. Details are available from the author.

Geographic distribution. *O. tortuosus* occurs predominantly in cool highland, summer rainfall regions of southern Africa (Fig. 17). Ferreira (1978) lists material she examined from Angola, Lesotho, South Africa and Zimbabwe. She also lists additional records obtained from the literature; these include records from Angola, Kenya, Mozambique, Tanzania and Zaire. However, *O. tortuosus* was not found by the CSIRO Dung Beetle Section during detailed surveys in Angola, Malawi, Kenya or Tanzania. Owing to the problems with the identification of this species, the specimens listed by Ferreira from Angola, Kenya, Tanzania and Zaire require further examination.

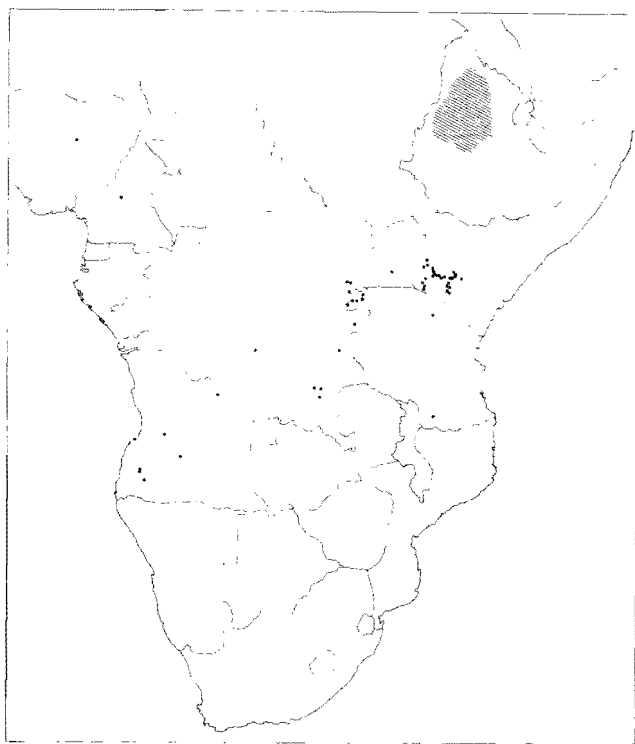


Fig. 16. Region where *Onitis crenatus* Reiche has been recorded (hatched - exact localities not known) and localities where *O. vanderkelleni* Lansberge (●) has been found.

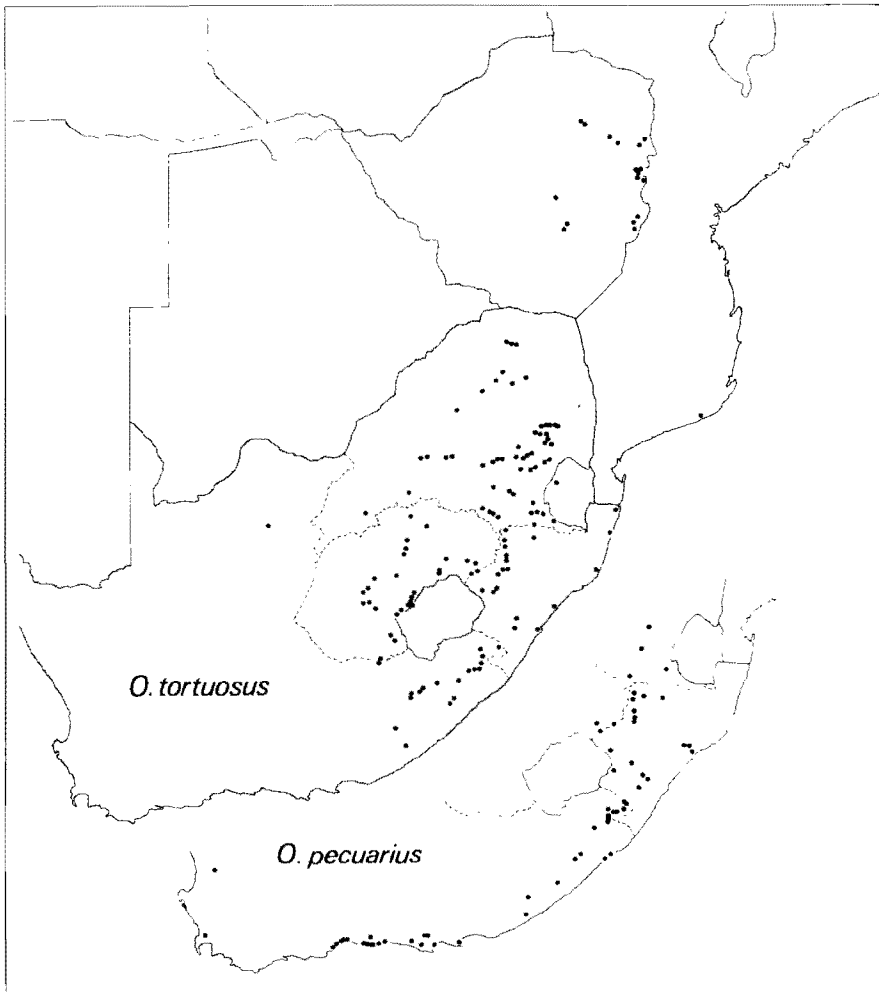


Fig. 17. Localities where *Onitis tortuosus* spec. nov., and *O. pecuarius* Lansberge have been found.

NOTES. *O. tortuosus* females are often confused with those of *O. pecuarius* Lansberge, a species restricted to southern Africa (Fig. 17); with *O. vanderkelleni*, whose geographic distribution (Fig. 16) does not overlap that of *O. tortuosus*; and with *O. reichei* and *O. viridulus*, species widely distributed in Africa and whose distributions overlap that of *O. tortuosus*. These species are readily separated from *O. tortuosus* by the following characters:

O. pecuarius. Male: clypeal carina equidistant between clypeal margin and tubercle of vertex and just behind level of clypeogenal cusps, hind trochanter tuberculate at apex, hind femur with outwardly and obliquely directed, blunt conical spine, with a carina extending towards the base of the femur. Female: clypeal carina closer to clypeal margin than to tubercle and in front of clypeogenal cusps.

O. reichei. Male and female: base of pronotum between basal fovea not bordered.

O. vanderkelleni. Male and female: pygidial basal carina not entire.

O. viridulus. Male and female: clypeal carina in front of level of clypeogenal cusps, base of pronotum between basal foveae not bordered.

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REFERENCES

- BOHEMAN, C. H. 1857. *Insecta caffrariae*, annis 1838–1845, Stockholm. Vol. 2: 252–253.
- FERREIRA, M. C. 1967. Os Escarabídeos de Moçambique. I. *Revista de Entomologia de Moçambique* 10(1, 2): 778 pp., 68 pls., 665 figs.
- FERREIRA, M. C. 1978. The genus *Onitis* F. of Africa south of the Sahara (Scarabaeidae, Coleoptera). *Memoirs van die Nasionale Museum, Bloemfontein* 10: 1–410.
- JANSSENS, A. 1937. Revision des Onitides. *Mémoires du Musée Royal d'Histoire Naturelle de Belgique* (2) 11: 1–200.
- JANSSENS, A. 1951. Onitini (Coleoptera, Lamellicornia). Fam. Scarabaeidae. In: *Exploration du Parc National de l'Upemba, Mission G. F. De Witte, 1946–49*, Brussels. Vol. 3, 41 pp., 57 figs.
- LANSBERGE, J. W. van. 1875. Monographie des Onitides. *Annales de la Société Entomologique de Belgique* 18: 1–148.
- PÉRINGUEY, L. 1902. Catalogue of the Coleoptera of South Africa. *Transactions of the South African Philosophical Society* 12: 118–151.
- REICHE, L. J. 1850. Entomologie. In: *Voyage en Abyssinie, dans les provinces du Tigré, du Samen et de l'Amhara* par P. V. Ferret & J. G. Galinier, Paris. Vol. 3: pp. 259–532, 7 pls.
- ROTH, J. R. 1851. Diagnosen neuer Coleoptera aus Abyssinien. *Archiv für Naturgeschichte* 17(1): 115–133.
- WATERHOUSE, D. F. 1974. The biological control of dung. *Scientific American* 230(4): 100–109.

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